STATE OF CONNECTICUT

DEPARTMENT OF PUBLIC UTILITY CONTROL
TEN FRANKLIN SQUARE
NEW BRITAIN, CT 06051

DOCKET NO. 03-01-15 DPUC INVESTIGATION INTO THE NEED FOR INTERCONNECTION STANDARDS FOR DISTRIBUTED GENERATION

April 21, 2004

By the following Commissioners:

Jack R. Goldberg
Donald W. Downes
John W. Betkoski, III
Linda J. Kelly
Anne C. George

DECISION

I. INTRODUCTION

A. SUMMARY

In this Decision, the Department adopts the small generator interconnection protocols of The United Illuminating Company and The Connecticut Light and Power Company. The Department makes certain changes to the protocols as they currently exist, and orders the Companies to submit future revisions to the Department.

B. BACKGROUND OF PROCEEDING

Section 16 of SB 733, AAC Revisions to the Electric Restructuring Legislation, states as follows:

> Not later than July 1, 2003, the Department of Public Utility Control shall open a docket to review and adopt generation interconnection protocols. If the Institute of Electrical and Electronics Engineers, or its successor, has adopted such protocols, then the department shall adopt such protocols.

The Department of Public Utility Control (Department) opened this docket in February, 2003 to conduct the above cited investigation.

C. CONDUCT OF PROCEEDING

By Notice of Written Comments dated May 7, 2003 the Department requested comments on a variety of issues relevant to the interconnection of small generators to an electric company's distribution system. The comments were due by May 30, 2003. Written comments were received from the following:

- Capstone Turbine;
- United Technologies Corporation (UTC);
- State of Connecticut Department of Environmental Protection;
- State of Connecticut Office of Consumer Counsel;
- OfficePower;
- Aegis Energy Services, Inc. (Aegis);
- Beacon Energy;
- The E Cubed Company, LLC;
- Northeast Combined Heat and Power Initiative;
- Ingersoll-Rand;
- The Connecticut Light and Power Company (CL&P);
- The United Illuminating Company (UI).

By Notice of Hearing dated June 5, 2003 the Department scheduled a hearing on this matter on September 8, 2003 at the Department's offices, Ten Franklin Square, New Britain, Connecticut 06051. By Notice of Rescheduled Hearing dated July 22, 2003 that hearing was cancelled and rescheduled to September 22, 2003 at the Department's offices. That hearing was held and continued to October 8, 2003. At that hearing, the participants agreed to hold meetings to discuss the issues in this proceeding, insofar as they involve CL&P's and UI's existing small generator interconnection guidelines (Guidelines). The participants also met to identify ways that the Guidelines could be modified to accommodate the interests of entities seeking to interconnect small generators to electric distribution systems. The participants agreed to provide the Department with a report on the discussions by December 22, 2003. Tr. 10/8/03, pp. 52-54.

On January 9, 2004, UI and CL&P (collectively, the Companies) provided the Department with a report stating that the discussions between the Companies and the other participants had been held, and the Companies had made changes to the Guidelines to address their concerns. Several of the participants submitted written comments that stated concerns with the Guidelines as revised. On January 16, 2004 the Companies submitted a letter providing their response to these comments and indicating that most of the comments have been addressed by revision to the Guidelines. However, certain issues remained unresolved. By Notice of Technical Meeting dated January 27, 2004, the Department held a technical meeting at the offices of the Department on February 24, 2004 to discuss exceptions to the interconnection guidelines.

II. ANALYSIS

A. GENERATOR COMMENTS ON THE INTERCONNECTION GUIDELINES

The requirements of electric distribution companies applicable to the interconnection of small generators[1] has been highly contentious across the country. The issues are myriad and complex, and often involve conflicts of interest between distribution companies and entities seeking to interconnect with the electric system. Several states have adopted protocols after lengthy proceedings involving numerous meetings and hearings. Efforts at the federal level by the Federal Energy Regulatory Commission to promulgate standards have largely stalled.

The Department believes, based on representations made in this proceeding and by reviewing industry literature on the topic, that entities seeking to interconnect desire interconnection requirements that minimize their cost, provide a reasonable degree of certainty regarding the costs likely to be incurred in satisfying the interconnection requirements, and provide an interconnection process that is easy to understand, follow and implement. Distribution companies are concerned primarily with the technical characteristics of the interconnecting equipment, and the impact such equipment may have on the design and operation of the electric system.

The Department's objective in this proceeding is to ensure implementation of a small generator interconnection process that reconciles the objectives of both parties. The Department has a strong statutorial mandate to oversee safety and reliability of the electric system. However, the Department also desires an interconnection process that minimizes the burden on entities seeking an interconnection to ensure the process is fair. Many renewable technologies are small generators that would be interconnected pursuant to the guidelines; therefore, a process that is unobstructive and minimizes interconnection costs promotes their development. Additionally, the proliferation of small generators can result in fuel diversification and further customer choice, while alleviating some congestion to capacity constrained areas. Conversely, small generators connected to lower voltage electric systems are electrically "weak" and less robust than large generators connected to high voltage systems, and are not subject to coordinated dispatch by a system operator. Large numbers of small generators may

[1] This decision refers to the collective body of entities owning, operating or installing small generators as "Generators". The lower case "generator" refers to the machine that generates electrical energy.

therefore weaken the integrity of the electric system. There are also maintenance and operational issues involving the interconnection of small generators that detract from its value to the electric system. The Department's action in this proceeding does not signify that it either advocates or opposes such generators.

UI and CL&P had pre-existing guidelines for the interconnection of small generators. Entering into this proceeding, the Companies had initiated a joint effort to arrive at a common set of guidelines, which was submitted to the Department by Response to Interrogatory EL-3. Subsequently, the Companies met with other participants in this proceeding regarding exceptions to the Guidelines, as discussed in Section III. However, certain issues were still contested, as discussed below.

1. Area Networks

Area networks are low voltage electrical systems served by multiple transformers located in densely populated metropolitan areas to provide large numbers of customers with highly reliable electrical service. The Guidelines prohibit interconnection of generators to area networks. Officepower and UTC believe that small generators can be successfully interconnected with area networks, and cite experience in Massachusetts and New York where projects have been interconnected. Further, the interconnection guidelines approved in Massachusetts provide for interconnection to such systems. Tr. 10/8/03, p. 61.

The Companies state that they allow interconnections to spot networks, which are generally higher voltage and specific to single customers, on a case specific basis. However, the Companies have never allowed interconnections to area networks, due to significant protection and reliability issues involved in such interconnections, which are not fully understood. Further, the recognized national standard for small generator interconnections, the Institute of Electrical and Electronics Engineers' (IEEE) 1547, does not at present provide for such interconnections, although there is an effort to form a committee to write interconnection guidelines for low voltage area networks. UI/CL&P letter dated January 16, 2004, p. 2.

The Department believes that this issue is not sufficiently developed to be addressed in this proceeding. There is a lack of history and evidence from other jurisdictions regarding successful interconnections to area networks. Given the sensitivity of such networks to attached generators, and the potential for negative impacts on reliability, the Department believes no reason exists to modify the Guidelines to accommodate such interconnections at this time. Furthermore, as discussed at the February 24, 2004 technical meeting, area networks are a very small part of the Companies' distribution systems, generally less than 1%. The Companies rarely receive requests for interconnections on these systems. The Department notes that some limited options exist for interconnecting generators for customers that are interconnected to area networks, such as providing them with a radial feeder from another circuit.

The Department believes the Companies should work with Generators that desire to interconnect to area networks on a case-by-case basis, to determine if they can be safely connected. The Companies should monitor industry developments

regarding area networks, such as the IEEE standards presently under development. Also, the Companies should monitor other jurisdictions where connections to area networks are allowed. Review of case histories from these other jurisdictions could provide valuable insight into what could be safely allowed to interconnect in Connecticut. The Department will follow up on this issue with the Companies to ensure that they are making such efforts with the ultimate goal of accommodating area network interconnections in the future. The Department expects that, at a minimum, the guidelines will be revised to allow area network interconnections following adoption of the IEEE standards.

2. Disconnect Switch

The Guidelines require that an external disconnect switch be provided at the point of interconnection that is easily accessible to Company personnel that can be opened for isolation. The disconnect switch is a mechanical device used to isolate the Generator's electrical facilities. The disconnect switch is used to either isolate the generator from the Company's facilities for safety reasons, or to isolate the generator from the customer's facilities to enable work on the customer's facilities without de-energizing the customer's loads. Tr. 10/8/03, p. 19.

Aegis disagrees with the requirements of the Guidelines that an external and accessible disconnect switch must be provided, if the Generator has other means of ensuring isolation. Aegis states that induction generators are incapable of starting up on their own and inadvertently energizing circuits. Tr. 10/8/03, pp. 62-63; Aegis letter dated 12/22/03.

The Department believes the disconnect switch requirement is reasonable. Company workers should have positive confirmation and control over isolation devices to ensure electrical facilities cannot be energized during maintenance. Electrical workers should have complete control and assurance over the configuration of electrical systems they are working on. Relying on physical characteristics of the generators does not provide sufficient margin of safety against the potential for misoperation. The Department does not believe that a disconnect switch requirement imposes an undue burden on Generators.

The Department has also reviewed the California, New York and Massachusetts guidelines and notes that all require such a device. The Massachusetts guidelines particularly contain requirements for disconnect switches that are virtually identical to the Guidelines. It should be further noted that the Companies have modified the Guidelines to allow case-specific evaluations to determine if the disconnect switch requirement can be met by another device at the facility. Guidelines, p. 24. This will provide some flexibility in meeting this requirement.

3. Allocation of Costs

UTC states that the cost of interconnection can be significant, and can fundamentally alter the economics of installing distributed generation. UTC is concerned that the Guidelines do not provide reasonable certainty to the costs that will ultimately be borne by the Generator. The first deficiency, according to UTC, is that,

although the Guidelines require interconnection equipment costs and the costs of electric system upgrades resulting from the interconnection to be incurred by the Generator, it should limit those costs to those "reasonably" incurred.

UTC's second area of disagreement concerns the process used by the Guidelines to estimate costs. The Guidelines require Generators larger than 100 kW to bear the cost of performing studies of the interconnection, and requires all Generators to bear the cost of any modifications to the electric power system that are required to accommodate the interconnection. The Guidelines also state that the Generator will be provided with a cost estimate for required upgrades and additions accurate to within plus or minus 25%. Guidelines, pp. 13, 15-16. According to UTC, actual costs incurred by one of the Companies to accommodate an interconnection may deviate substantially from the estimate. UTC states that the Companies should be capable of estimating costs within 10% of actual, and notify customers of any increases beyond that. UTC also cites language in the Massachusetts interconnection tariff that alludes to reasonableness of costs, and caps the costs at 110% of the estimate. UTC Reply Comments dated 1/9/04, pp. 4-7.

The Companies state that the Guidelines should not cap the costs to be borne by the Generator, since this will result in cost-shifting to other classes. The Companies also note that the Guidelines provide a dispute resolution procedure in the event a Generator does not accept costs it is assigned as reasonable. Letter from CL&P and UI dated 1/16/04, p. 2.

The Department believes that the actual costs of modifications to accommodate the interconnection can vary significantly from the estimate, regardless of the experience of the Companies in designing and installing such facilities. Such uncertainties can be particularly exacerbated by field conditions that may differ substantially from those assumed in the cost estimate. This is typical of utility construction projects. The Department notes, as do CL&P and UI, that the Guidelines at pp. 31-32 provide a dispute resolution process. The Department believes that it is not productive to add "reasonable" to the cost assignment, since, if there is a dispute, the parties will fundamentally disagree on what is reasonable. The Department expects the Companies will not ask a Generator to bear an unreasonable cost.

The Department agrees with UTC that a Company should notify a Generator if it becomes aware that the actual cost of modifications will exceed 10%. The Guidelines presently do not provide such a requirement; however, customers should be aware as early in the process as possible whether there will be significant cost overruns. The Department believes 10% is a reasonable threshold, and hereby directs the Companies to modify the Guidelines to provide such notification.

The Department does not believe changing the Guidelines to cap the costs of accommodating the interconnection is fair or equitable. Costs in excess of the cap would initially be borne by the interconnecting Company, but would presumably be socialized among all ratepayers at the next rate case. The current and longstanding policy is that the Generator should pay all costs of the interconnection. This is

consistent with jurisdictions across the country.[2] Capping the costs would send a price signal to a utility to increase the estimates, which would discourage small generator installations. The Department concludes that the existing policy is proper; namely, that the Generator should pay the full incremental costs of accommodating the interconnection.

4. Processing Times

The Guidelines prescribe maximum processing times that are applicable to the total time that the Companies may take to complete review of a proposed generator interconnection. These times includes the time to review the completed application and the time to complete all studies of the interconnection. Guidelines, p. 11. Aegis and UTC believe that some processing times stated in the Guidelines are too long, and that the Guidelines should be modified to require shorter times. For example, Aegis states that the application processing time of 30 business days for Category 2 generators (10 kW to 100 kW) should be shortened, as a typical complete installation takes 90 to 120 calendar days. Aegis letter dated 12/22/03. UTC states that the Guidelines do not recognize expedited treatment for interconnection equipment that has been pre-certified to national safety codes. UTC Reply Comments dated 1/9/04, p. 1.

Many issues in this proceeding are compared to how they were resolved in Massachusetts. This issue has not been fully resolved in that state. The guidelines approved in Massachusetts, however, provide maximum times that are comparable to those in the Guidelines. Depending on the type of generator installation, the Guidelines provide a maximum of from 20 to 120 business days for a Company to complete a review, whereas the Massachusetts Guidelines allow from 15 to 150 business days. Guidelines, p. 11; Massachusetts Tariff, p. 18.

The Companies state that shorter times will often be required to accomplish reviews, and that their past record shows that their reviews are generally faster than the maximum times in the Guidelines. The Department's review of data provided by the Companies in their Responses to Interrogatories EL-1 and EL-4 confirms this. The processing times should allow the Companies to adequately review proposed interconnections, without undue delay. The Department believes the time requirements in the Guidelines accomplish this. It should be noted that, as time goes on and the Companies become familiar with working with the Guidelines, the time it takes to improve an interconnection should decrease. The Department also notes that it will hear complaints from any party that believes a Company is taking too long to review an application. The Department concludes that the proposed processing times are reasonable.

5. Miscellaneous

UTC makes a number of comments regarding the Guidelines that are requests for clarifications, not exceptions to them. UTC Written Comments dated 1/9/04, pp. 3-4. To the extent they have not already been addressed, the Department does not believe

[2] The issue is not resolved in Massachusetts, where the DG Cluster and the Utility Cluster proposed different language and requirements. Massachusetts Tariff, p. 33.

that it is practical to revise the Guidelines for these reasons within the context of this proceeding. No other party requested clarifications on these matters; therefore, it is best questions like them be addressed individually with users of the Guideline. The Department believes that on these and similar questions the Company facilitators should work with Generators to enable them to comprehensively understand the Guidelines. Should certain clarification requests become chronic, the Guidelines should be revised to reflect them.

B. ADOPTION OF THE GUIDELINES

Section 16 of SB 733, AAC Revisions to the Electric Restructuring Legislation, states as follows:

> Not later than July 1, 2003, the Department of Public Utility Control shall open a docket to review and adopt generation interconnection protocols. If the Institute of Electrical and Electronics Engineers, or its successor, has adopted such protocols, then the department shall adopt such protocols.

The Department hereby adopts the Guidelines as its standards for the interconnection of small generators, as modified herein. As such, the Department considers the Guidelines to be subject to the Department's oversight. The Department will order all future revisions to the Guidelines to be submitted to the Department for its information. From time to time, the Department may investigate or recommend changes to the Guidelines.

The Department further notes that, among other technical requirements, the Guidelines require interconnected generators to meet the requirements of IEEE 1547-2003, IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems, and accompanying standards. Guidelines, Attachment 4. These are the standards referred to in the above-cited Section 16 of SB 733. By adoption of the Guidelines, therefore, the Department also adopts the applicable IEEE standards.

As documented in the letters from the Companies dated January 9, 2004 and January 16, 2004, the Companies made numerous changes to the Guidelines based on the input of the other participants. Based on the large number of changes the Companies made at the request of the Generators, and the evident lack of resistance from the Companies to them, the Department believes the Companies have been very accommodating to the interests of the small generator industry. The Department commends the participants in this proceeding for their cooperation in conducting an open dialogue on these matters. Areas of disagreement with the Guidelines (as revised) are minimal. The Department believes the lack of significant exceptions to the Guidelines and the general level of satisfaction with them that was expressed at the February 24, 2004 technical meeting are symptomatic of the success of this proceeding.

The Department further notes that the Guidelines are only intended to give general guidance. Generator interconnections are varied and complex, and it is not practical to expect that they should be rigidly observed at all times. Rather, facilitators from the Companies will be expected to work closely with Generators to understand and

implement the Guidelines. The Department further notes that it has only received one complaint regarding the interconnection practices of one of the Companies over the last 10 years. The Department considers this to be an excellent record, and does not expect it to change with the implementation of the Guidelines.

III. CONCLUSION

The Department commends the Companies and the Generators for working together in a spirit of cooperation in this Proceeding. Based on input from all the parties, the Department believes that the Guidelines, as modified herein, will ensure that distributed generation interconnection practices are standardized and properly balance the interests of all stakeholders.

III. ORDERS

1. Not later than April 30, 2004 the Companies shall revise the Guidelines to incorporate the changes required in Section II.A of this Decision and shall submit a copy of the revised Guidelines to the Department.

2. Within 10 days following the effective date of every future revision of the Guidelines, the Companies shall submit the following: a clean copy of the new revision, a copy showing all changes highlighted, and an explanation for each change to the Guidelines.

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This Decision is adopted by the following Commissioners:

Jack R. Goldberg

Donald W. Downes

John W. Betkoski, III

Linda J. Kelly

Anne C. George

CERTIFICATE OF SERVICE

The foregoing is a true and correct copy of the Decision issued by the Department of Public Utility Control, State of Connecticut, and was forwarded by Certified Mail to all parties of record in this proceeding on the date indicated.

Louise E. Rickard Acting Executive Secretary Department of Public Utility Control	April 21, 2004 Date